DRAFT

Part XV-A

Transportation/Traffic

Traffic

County of San Diego

Draft Guidelines for Determining Significance

Adopted,
_____ 2004

DRAFT

CERTIFICATE OF ADOPTION

I hereby certify that these Guidelines, consisting of this text, are the **Guidelines for Determining Significance for Traffic** and are a part of the County of San Diego Guidelines for Determining Significance, Part XV-A, and were considered by the Director of Planning and Land Use on the _____ day of ____ 2004.

_____
GARY PRYOR, Director

_____
Attest: ERIC GIBSON, Deputy Director

I hereby certify that these Guidelines, consisting of this text, are the **Guidelines for Determining Significance for Traffic** and are a part of the County of San Diego Guidelines for Determining Significance, Part XV-A, and were adopted by the Deputy Chief Administrative Officer of the Land Use and Environment Group on the _____ day of ____ 2004.

_____
ROBERT R. COPPER, Deputy CAO

_____
Attest: _____, Secretary

Upon adoption the County shall be permitted to periodically update or improve the **Guidelines for Determining Significance for Traffic**, as deemed necessary by the Director of Planning and Land Use. However, the Deputy CAO must adopt any changes to actual Guidelines for Determining Significance presented in Chapter 4.0.

Text

Adopted _____ 2004

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DISCLAIMER

The County of San Diego Guidelines for Determining Significance and information presented herein shall be used by County staff for the review of discretionary projects and in the review of environmental documents pursuant to the California Environmental Quality Act (CEQA). These Guidelines present a range of quantitative, qualitative, and performance levels for particular environmental effects. Normally non-compliance with a particular Guideline will mean the project will result in a significant effect, whereas compliance will normally mean the effect will be determined to be "less than significant." Section 15064(b) of the State CEQA Guidelines state: "The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on factual and scientific data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting." These Guidelines assist in providing a consistent, objective and predicable evaluation of significant effects. These Guidelines are not binding on any decision-maker and should not be substituted for the use of independent judgment to determine significance or the evaluation of evidence in the record. The County reserves the right to modify these Guidelines in the event of scientific discovery or alterations in factual data that may alter the common application of a Guideline.

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List of Acronyms

ADT	Average Daily Trips
CALTRANS	California Department of Transportation
CEQA	California Environmental Quality Act
CMP	Congestion Management Plan
DPLU	Department of Planning and Land Use
HCM	Highway Capacity Manual
ITE	Institute of Traffic Engineers
LOS	Level of Service
min	Minute
mph	Miles per Hour
MTDB	Metropolitan Transit Development Board
NCTD	North San Diego County Transit District
PFE	Public Facilities Element
RTP	Regional Transportation Plan
SANDAG	San Diego Association of Governments
SANTEC	San Diego Traffic Engineers' Council
sec	Second
TIS	Traffic Impact Study
V/C	Volume to Capacity
VMT	Vehicle Miles Traveled

INTRODUCTION

This document provides guidance for evaluating adverse environmental effects that a proposed project may have on traffic. Specifically, this document addresses the following questions listed in the California Environmental Quality Act (CEQA) Guidelines, Appendix G, XV, Transportation/Traffic:

Would the project:

a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?

b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways? Or individually or cumulatively worsen a road already exceeding the level of standard?

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

e) Result in inadequate emergency access?

g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?

Traffic and traffic-related impacts are major concerns for the San Diego Region. As population in the San Diego Region grows, traffic, as measured by average daily trips (ADT), also grows. Land development within the San Diego region contributes to growth in population and growth in traffic. The rate of land development, population and traffic growth has often outpaced the provision of needed transportation infrastructure to adequately accommodate the increased growth. As a result, traffic congestion is a common occurrence on many freeways, highways and arterials in the San Diego region.

1.0 GENERAL PRINCIPLES AND EXISTING CONDITIONS

The population of the San Diego Region is projected to increase from approximately 2.9 million people today to about 3.9 million in the year 2020. As a result, the number of forecasted vehicle trips is projected to increase by 34 percent from current levels. Road improvements will be needed to accommodate the anticipated growth in traffic; otherwise, traffic congestion will increase significantly.

As a means of measuring and evaluating traffic congestion, the concept of level of service was created. Level of service (LOS) is a quality of service measure that describes operational conditions on a transportation facility, such as a roadway or intersection. Levels of service are established based upon the driver's perspective. This service measure is a general overall measurement of several conditions such as speed

and travel time, freedom to maneuver, traffic interruption, and comfort and convenience. Safety is an important concern but, typically, is not included in the measures that establish service levels.

Six LOS categories are defined for each type of facility. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions. Methods for identifying levels of service vary based upon the type of transportation facility. Criteria for identifying levels of service on County of San Diego arterials are provided in the County of San Diego Public Road Standards. Methods of identifying levels of service for freeways, highways and intersections are provided in the Highway Capacity Manual (HCM). A detailed discussion of level of service and an excerpted table from the Public Road Standards is provided in Attachment A. Also, definitions of some key traffic terms are included in Attachment D.

On February 25, 2000 the San Diego Association of Governments (SANDAG) Board adopted the 2020 Regional Transportation Plan (RTP). This plan establishes goals and policies for addressing the needs of the regional transportation network in the San Diego region. A needs assessment was included in the RTP. It identified that in 1998, 13 percent (77 of 600 directional-miles) of the San Diego Region's freeway system operated at LOS F, an unacceptable level of service. Although not documented in the report, many of the region's local arterials and highways are also operating at unacceptable levels of service.

The 2020 RTP also identifies 66 directional miles of new highway projects, oriented primarily to freeway projects, although some local transportation projects are also included. If implemented, these projects alone will not fully relieve existing and anticipated future congestion. As the region's population, employment and vehicle miles traveled (VMT) increase, congestion will also increase unless additional transportation improvements are made. SANDAG is in the process of updating the RTP to provide a 2030 RTP. Additional road and highway improvements may be assumed in the updated plan.

Levels of service is used primarily to assess how substantial increases in vehicular traffic may affect traffic congestion on specific transportation facilities, such as freeways, arterials, and intersections. Procedures have also been established to adjust the evaluation to account for trucks, buses, grade and pedestrian volumes. Substantial traffic volume increase may also result in other traffic related impacts. Where applicable, evaluations should be made to assess the potential for traffic related impacts for the following items[1]:

- Regional transportation facilities; including freeways, state highways and ramps
- Local circulation and road network
- Adequacy of existing roadway and/or intersection design features
- Access (both primary and secondary, as required)

[1] Parking capacity is addressed in the County's "Guidelines for Determining Significance for Parking."

- Alternative transportation modes; including pedestrians, bicyclists and transit

In order to evaluate potential traffic impacts that may result from a specific project, traffic impact studies are often prepared. Traffic impact studies include estimates of the amount of traffic generated by the project, distributions of project traffic and/or redistributions of traffic caused by the project, assessments of potential traffic impacts, and when applicable the identification of mitigation measures to alleviate project-related traffic impacts.

The responsible agency for final approval of a project's traffic study is the agency that has discretionary approval of the project. For most projects located in the unincorporated area of San Diego, the responsible agency is the County of San Diego; however, coordination with other affected agencies is often necessary in the preparation of traffic impact studies. SANDAG is the agency responsible for the oversight of regional transportation planning. The California Department of Transportation (Caltrans) is the State agency responsible for planning, constructing and maintaining the State highway network. In addition to the County of San Diego, eighteen other municipalities within the San Diego Region are responsible for planning, constructing and maintaining local transportation networks within their respective areas of jurisdiction.

2.0 EXISTING REGULATIONS AND GUIDELINES

The following list details the most significant regulations that address traffic impacts in California and the County of San Diego.

2.1 State Regulations and Standards

California Environmental Quality Act (CEQA) [Public Resources Code 21000-21178; California Code of Regulations, Guidelines for Implementation of CEQA, Appendix G, Title 14, Chapter 3, §15000-15387. http://ceres.ca.gov/topic/env_law/ceqa/guidelines/]
Under the California Environmental Quality Act (CEQA) lead agencies are required to consider traffic impacts when assessing the environmental impacts of proposed projects. CEQA requires discretionary projects to evaluate the effect projects may have of traffic circulation.

2.2 Local Regulations and Standards

SANDAG Standards - Congestion Management Program [Congestion Management Program Update, January 2003, San Diego Regional Planning Agency, http://www.sandag.org/uploads/publicationid/publicationid_736_1278.pdf]
State Proposition 111, passed by voters in 1990, established a requirement that urbanized areas prepare and regularly update a Congestion Management Program (CMP), which is a part of SANDAG's Regional Transportation Plan (RTP). The purpose of the CMP is to monitor the performance of the region's transportation system, develop programs to address near-term and long-term congestion, and better integrate transportation and land use planning. SANDAG, as the designated Congestion Management Agency for San Diego region, must develop, adopt and update the CMP in

response to six specific legislative requirements further described in the report. SANDAG, local jurisdictions, and transportation operators (i.e., Caltrans, Metropolitan Transit Development Board (MTDB), North San Diego County Transit District (NCTD), etc.) are responsible for implementing and monitoring the CMP.

The CMP has five major components. One such component is a Land Use Analysis Program. Under this program, the CMP requires a review of large projects that generate 2,400 or more average daily trips or 200 or more peak hour trips. This review must assess impacts to state highways and regionally significant arterials. An excerpted list of these roadways from the CMP is included below. For further information refer to the CMP, Map 4-1 and Exhibit 4-1, pp. 27-28. A copy of the CMP can be obtained from SANDAG or online.

List of CMP System Roadways

CMP Freeways
Interstate 5: Orange County Line to U.S./Mexico Border
Interstate 8: Nimitz Boulevard to Imperial County Line
Interstate 15: Riverside County Line to I-5
Interstate 805: I-5 (North) to I-5 (South)
State Route 52: I-5 to SR 25
State Route 54: I-5 to Briarwood Road
State Route 56: I-5 to Carmel Valley Road and I-15 to Black Mountain Road
State Route 67: Mapleview Street to I-8
State Route 78: I-5 to North Broadway
State Route 94: I-5 to Avocado Boulevard
State Route 125: SR 54 to SR 94
State Route 163: I-15 to I-5
State Route 905: Oro Vista Road to Otay Mesa Road

CMP Highways
State Route 54: I-8 to SR 94
State Route 67: SR 78 to Mapleview Valley
State Route 75: I-5 (North) to I-5 (South)
State Route 76: Coast Highway to SR 79
State Route 78: North Broadway to Imperial County Line
State Route 79: Riverside County Line to I-8
State Route 94: Avocado Boulevard to Old Highway 80
State Route 282: Alameda Boulevard to Orange Avenue

CMP Arterials
(1) Balboa Avenue: I-5 to I-15[2]
(2) Centre City Parkway: I-15 (North) to I-15 (South)
(3) Fletcher Parkway/Broadway/E. Main Street/Greenfield Drive: I-8 (West) to I-8 (East)
(4) La Jolla Village Drive/Miramar Road: I-5 to I-15

[2] This CMP Arterial was formerly designated as CMP State Highway 274.

(5) Manchester Avenue/El Camino Real: I-5 to SR 76/Mission Avenue
(6) Nimitz Blvd./North Harbor Dr./Grape & Hawthorne Streets/Pacific Highway/Harbor Drive: I-8 to I-5
(7) Olivenhain Road/Rancho Santa Fe Road: El Camino Real to SR 78
(8) Otay Mesa Road-Interim SR 905: SR 905 (West) to SR 905 (East)2
(9) Palomar Airport Road/San Marcos Boulevard: I-5 to SR 78
(10) Sea World Drive/Friars Road/Mission Gorge Road/Woodside Avenue: I-5 to SR 67
(11) Scripps Poway Parkway: I-15 to SR 67
(12) SR 54 & Sweetwater Road-Interim SR 125: I-805 to Broadway[3]

Public Facilities Element (Part XII) of the San Diego County General Plan [http://ceres.ca.gov/planning/counties/San_Diego/plans.html]
The County of San Diego General Plan Public Facilities Element establishes policies and implementation measures regarding the assessment and mitigation of traffic impacts of new development. One of the goals of the Public Facilities Element (PFE) is to provide "A safe, convenient, and economical integrated transportation system including a wide range of transportation modes (PFE, page XII-4-18)." The PFE also identifies an objective in the Transportation Section to provide a "Level of Service C or better on County Circulation Element roads. (PFE, page XII-4-18)." The PFE, however, establishes LOS D as an off-site mitigation threshold for discretionary projects. When an existing Level of Service is already D, "a LOS of D may be allowed (PFE, page XII-4-18)." According to the PFE, projects that significantly increase congestion on roads operating at LOS E or LOS F must provide mitigation. According to the PFE, this mitigation can consist of a fair share contribution to a program to mitigate the project's impacts. If adequate mitigation cannot be provided, then a statement of overriding findings would need to be made by the decision-makers pursuant to Sections 15091 and 15093 of the State CEQA Guidelines to approve the project as proposed.

San Diego County Private Road Standards [http://www.sdcounty.ca.gov/dpw/land/rtelocs.htm]
These standards provide minimum design and construction requirements for private roads. Levels of service are not established for private roads. Minimum design and construction requirements, however, are established based upon the project average daily traffic (ADT) volume on the road.

San Diego County Public Road Standards [http://www.sdcounty.ca.gov/dpw/land/rtelocs.htm]
These standards provide minimum design and construction requirements for private roads. Levels of service are established for Circulation Element roads. Levels of service are not applied with the non-Circulation Element residential roads. Target design capacities, however, have been identified for these roads.

[3] These CMP Arterials are designated as interim facilities on the CMP network and will be replaced by a state highway following their construction.

2.3 Regional and Local Traffic Impact Analysis Guidelines

San Diego Traffic Engineers' Council (SANTEC) and the Institute of Traffic Engineers (ITE)

The San Diego Traffic Engineers' Council (SANTEC) and the local chapter of the Institute of Traffic Engineers (ITE) have endorsed for use the "Guidelines of Traffic Impact Studies (TIS) in the San Diego Region." These guidelines were prepared by a traffic subcommittee formed by SANDAG. The purpose of the subcommittee was to develop a model set of guidelines for the analysis of traffic impacts for adoption and use by the various jurisdictions in the San Diego region. The goal was to foster more consistency in the assessment of traffic impacts in the San Diego region. These guidelines establish a LOS target of LOS D. Impacts would be identified for those projects that significantly increase the volume and or delay at intersections and road segments operating below LOS D (i.e. at LOS E of LOS F) either prior to or as a result of the proposed project. These guidelines have not been formally adopted by SANDAG or local jurisdictions, but are currently being used as a guideline by many local traffic-engineering consultants in the preparation of traffic impact studies in the San Diego Region.

California Department of Transportation (Caltrans)

The California Department of Transportation (Caltrans) has prepared a "Guide for the Preparation of Traffic Impact Studies." Objectives for the preparation of this guide include providing consistency and uniformity in the identification of traffic impacts generated by local land use proposals. In terms of level of service, "Caltrans endeavors to maintain a target LOS at the C/D cusp on State highway facilities. However, Caltrans acknowledges that this may not always be feasible. In these circumstances, Caltrans may consider setting the target LOS at the D/E cusp."

City of San Diego

The City of San Diego has prepared a "Traffic Impact Study Manual." The purpose is to provide guidelines to consultants on how to prepare traffic impact studies in the City of San Diego and to ensure consistency on the preparation of these studies. Impacts are identified if the proposed project will increase the traffic volume on a road segment above an identified allowable increase. The better the initial level of service on the road segment, the higher the allowable volume increase.

3.0 TYPICAL ADVERSE EFFECTS

Typical traffic related impacts are most often associated with traffic congestion on local roads and the regional circulation network. As the San Diego region grows, the number of vehicle trips that are generated by residents also grows. Historically, vehicle trips have been increasing at a faster rate than that of the population growth. It is forecasted that more than 23 million vehicle trips would be made in this region each weekday by the year 2020. The automobile is expected to remain the primary method of travel in the region, but new and widened freeways, increased trolley and bus service, better rail service, and additional highway improvements would alleviate some of the traffic

congestion. SANDAG's 2020 RTP details some of the regional improvements that are projected to occur within a twenty-year time frame. Impacts associated with traffic, pedestrian and bicycle safety are most often addressed at the project level.

4.0 GUIDELINES FOR DETERMINING SIGNIFICANCE

This section provides guidance for evaluating adverse environmental effects a project may have on traffic. The guidelines for determining significance are organized into six subject areas: direct vs. cumulative, road segments, intersections, ramps, hazards due to a design feature, and hazards to pedestrians and/or bicyclists.

4.1 Direct vs. Cumulative Impacts

The California Environmental Quality Act (CEQA) Guidelines states that environmental assessments must take in account the "whole of the action" involved, including on-site, off-site, construction, and operational impacts. Also, the environmental assessment must evaluate project-level and cumulative impacts, including direct and indirect impacts.

4.1.1 Direct

Direct impacts are impacts that would result solely from the implementation of the project. Since CEQA requires a plan to ground assessment, direct impacts are typically evaluated based upon a comparison of the existing plus project scenario to the existing scenario. When opening day and/or a phased scenario is planned, additional comparisons may also be made to determine significance. Where it can be demonstrated that other projects will reasonably come on-line prior to development of the proposed project, an opening day assessment scenario may be used in lieu of the existing plus project approach. Coordination with County staff is recommended to ensure that proper assumptions are used in the preparation of this assessment scenario. Direct impacts would occur when the significance criteria outlined herein is exceeded.

4.1.2 Cumulative

CEQA section 15130 provides guidance for assessment of cumulative impacts. Per this section, CEQA states that cumulative impact assessments should be based upon 1) a list of past, present and probable future projects producing related or cumulative impacts, (includes all projects and if necessary, those projects outside the control of the agency), or 2) a summary of projects contained in an adopted general plan or related planning document, or in a prior certified/adopted environmental document which described or evaluated regional or area wide conditions contributing to the cumulative impact. For most projects, the list of past, present and probable projects approach is used for the assessment of cumulative impacts.

For projects that will be implemented and constructed in the near term, the "list of projects" approach is typically used in the assessment and evaluation of cumulative impacts. The assessment of cumulative projects can also be based upon a summary of projections contained within an adopted General Plan or related planning documents. This is typically used when the project includes a change to the County's General Plan or Zoning Ordinance. Projects that include both a change to near term development and the County's General Plan or Zoning may be required to provide both levels of evaluation.

Section 15130(a) of the State CEQA Guidelines state that cumulative impacts of a project should be discussed when the project impacts, even though individually limited, are cumulatively considerable. Cumulatively considerable means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. In evaluating cumulative traffic impacts two conditions must be evaluated: 1) will build-out of all near term projects result in a cumulative traffic impact and 2) does the amount of traffic generated by the individual proposed project contribute (even in a small part) to that cumulative impact. Both conditions must be met for an individual project to result in a cumulative traffic impact.

Cumulative traffic impacts are typically evaluated based upon a comparison of the near-term cumulative projects plus the proposed projects scenario (list of projects) to the existing scenario. If cumulative impacts are found to be significant, each project that contributes any trips must mitigate a share of the cumulative impacts.

4.2 Road Segments

Exceedance of the following significance guidelines will be considered substantial evidence that private development and public improvement projects will have a significant traffic volume and/or level of service traffic impact on a road segment if:

- ***The additional or redistributed ADT generated by the proposed project will cause an adjacent or nearby County Circulation Element Road to operate below LOS D and will significantly increase congestion as identified in Table 1, and/or***

- ***The additional or redistributed ADT generated by the proposed project will cause a residential street to exceed its design capacity, and/or***

- ***The additional or redistributed ADT generated by the proposed project will significantly increase congestion on a Circulation Element Road, State Highway or intersection currently operating at LOS E or LOS F as identified in Table 1.***

Table 1 - Measures of Significant Project Impacts to Congestion
Allowable Increases on Congested Roads and Intersections

Road Segments

	2-LANE ROAD	4-LANE ROAD	6-LANE ROAD
LOS E	200 ADT	400 ADT	600 ADT
LOS F	100 ADT	200 ADT	300 ADT

Intersections

	SIGNALIZED	UNSIGNALIZED
LOS E	Delay of 2 seconds	20 peak hour trips on a critical movement
LOS F	Delay of 1 second, or 5 peak hour trips on a critical movement	5 peak hour trips on a critical movement

Note: A critical movement is one that is experiencing excessive queues.
Note: By adding proposed project trips to all other trips from a list of projects, these same tables are used to determine if total cumulative impacts are significant. If cumulative impacts are found to be significant, each project that contributes any trips must mitigate a share of the cumulative impacts.
Note: The County may also determine impacts have occurred on roads even when a project's traffic or cumulative impacts do not trigger an unacceptable level of service, when such traffic uses a significant amount of remaining road capacity.

The County of San Diego Public Road Standards include a table which establishes levels of service for County Circulation Element roads based upon average daily trips. This table shall be used in determining the level of service for County Circulation Element roads. The Highway Capacity Manual (HCM) includes analysis criteria for the assessment of the level of service for two-lane highways. The Director of Public Works may, based upon a review of the operational characteristics of the roadway, designate that a HCM analysis be used to determine the level of service for a two-lane County arterial in lieu of the level of service table provided in the County of San Diego Public Road Standards.

In determining the level of service for road segments and intersections outside of the County of San Diego's jurisdiction, the level of service standards for the jurisdiction or agency (Caltrans) shall be used. Early coordination with the affected jurisdiction and/or agency (Caltrans) should be conducted during the preparation of the traffic impact study.

Capacity is related to level of service. The capacity of a facility is the maximum number of persons or vehicles that can be expected to traverse a point or uniform section of road within a specified time frame under prevailing roadway, traffic and control conditions. The LOS E/LOS F threshold is identified as the capacity of the facility (roadway or intersection). Volume to capacity ratios are calculated based upon this capacity (LOS E/LOS F) threshold.

Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots and not to carry through traffic. Congestion from the driver's perspective is typically not a concern. Compatibility of the traffic volumes on the local street in relation to the adjacent uses, however, may be an issue of concern. Recommended design capacities for residential non-Circulation Element streets are provided in the San Diego County Public Road Standards. For projects that will substantially increase traffic volumes on residential streets, a comparison of the traffic volumes on the residential streets with the recommended design capacity shall be provided.

The impact significance guidelines for road segments provided in Table 1 are based upon a general assessment and average conditions. These guidelines are based upon an assumed allowable 200 average daily trip (ADT) threshold for a two-lane road. These assumptions were augmented for 4-lane and 6-lane roads. For 4-lane roads they were doubled (400 ADT) and for 6-lane roads they were tripled (600 ADT). Conservatively under worse case assumption this would be applied unidirectionally (project traffic only being assigned to one-side of the road). Using SANDAG's "Brief Guide for Vehicular Traffic Generation Rates for the San Diego Region" for most discretionary projects this would convert to less than 25 AM or PM peak hour trips. On average, during peak hour conditions, this would be only one additional car every 2.4 minutes. The addition of 200 ADT would, in most cases, not be noticeable to the average driver. Under extremely congested LOS F conditions, small changes and disruptions to the traffic flow can significantly affect traffic operations. Additional project traffic could increase the likelihood and/or frequency of these events. The allowable LOS F ADT threshold was, therefore, set at 50% of the LOS E threshold to provide a higher level of assurance that the traffic allowed under the threshold would not significantly impact traffic operation on the road segment.

For smaller discretionary projects, without controversy, the use of these guidelines is likely to be sufficient. For large projects, controversial projects and/or projects which are preparing Environmental Impact Reports, more detailed evaluations to verify the applicability of the significance thresholds for the individual project conditions may be necessary. Additional evaluations may include analysis of vehicle headways, speeds, average gaps, queues, delay, and/or other factors.

Projects that must prepare a CMP analysis, should also follow the CMP and SANTEC/ITE traffic impact analysis guidelines. A summary of these guidelines is provided in Table 2.

Table 2 - Measure of Significant Project Traffic Impacts for Circulation Element Roads, Signalized Intersections, and Ramps

Level of Service With Project	Allowable Change due to Project Impact						
	Freeways		Roadway Segments*		Intersections**	Ramps***	Ramps with >15 min. delay
	V/C	Speed (mph)	V/C	Speed (mph)	Delay (sec.)	Delay (min.)	Delay (min.)
E & F	0.01	1	0.02	1	2	-	2

* For County arterials which are not identified in SANDAG's Regional Transportation Plan and Congestion Management Plan as regionally significant arterials, then significance may be measured based upon an increase in average daily traffic. The allowable change (ADT) due to project impacts in this instance would be identified in Table 1.

** Signalized intersections

*** See Attachment E for ramp metering analysis.

KEY
V/C = Volume to Capacity ratio
Speed = Speed measured in miles per hour
Delay = Average stopped delay per vehicle measured in seconds, or minutes
LOS = Level of Service
ADT = Average Daily Trips

4.3 Intersections

This section provides guidance for evaluating adverse environmental effects a project may have on signalized and unsignalized intersections.

4.3.1 Signalized

Exceedance of the following significance guidelines will be considered substantial evidence that private development and public improvement projects will have a significant volume and/or level of service traffic impact on a signalized intersection if:

- ***The additional or redistributed ADT generated by the proposed project will cause a signalized intersection to operate below LOS D and will significantly increase congestion as identified in Table 1, and/or***

- ***The additional or redistributed ADT generated by the proposed project will significantly increase congestion on a signalized intersection currently operating at LOS E or LOS F as identified in Table 1.***

Significance criteria for signalized intersections identified in Table 1 allows an increase in the overall delay at an intersection operating at LOS E of two seconds. An increased wait time of two seconds, on average, would not be noticeable to the average driver. For LOS F conditions, however, a guideline based upon the number of trips added to a critical movement was used. This threshold directly relates to the number of vehicles that can be added to an existing queue that forms at the intersection. A threshold of five trips (peak hour) per critical movement was used. The five trips spread out over the peak hour would not significantly increase the length of an existing queue and would not be noticeable to the average driver.

For smaller discretionary projects, without controversy, the use of these guidelines is likely to be sufficient. For large projects, controversial projects and/or projects which are preparing Environmental Impact Reports, more detailed evaluations to verify the applicability of the significance thresholds for the individual project conditions may be necessary. Additional evaluations may include analysis of vehicle headways, speeds, average gaps, queues, delay, and/or other factors.

4.3.2 Unsignalized

The operating parameters and conditions for unsignalized intersections differ dramatically from those of signalized intersections. Very small volume increases on one leg or turn/thru movement of an unsignalized intersection can substantially affect the calculated delay for the entire intersection. Significance criteria for unsignalized intersections was based upon a minimum overall number of trips added to a critical movement (such as a left turn lane estimated to operate at LOS E of LOS F) at an unsignalized intersection.

Exceedance of the following significance guidelines will be considered substantial evidence that private development and public improvement projects will have a significant volume and/or level of service traffic impact on a unsignalized intersection if:

- ***The proposed project will generate 20 or more peak hour trips to a critical movement of an unsignalized intersection, and cause the unsignalized intersection to operate below LOS D, or***

- ***The proposed project will generate 20 or more peak hour trips to a critical movement of an unsignalized intersection and the unsignalized intersection currently operates at LOS E, or***

- ***The proposed project will generate 5 or more peak hour trips to a critical movement of an unsignalized intersection, and cause the unsignalized intersection to operate below LOS E, or***

- ***The proposed project will generate 5 or more peak hour trips to a critical movement of an unsignalized intersection and the unsignalized intersection currently operates at LOS F, or***

- ***Based upon an evaluation of existing accident rates, the signal priority list, intersection geometrics, proximity of adjacent driveways, sight distance and/or other factors, it is found that the generation rate less than those specified above would significantly impact the operations of the intersection.***

The significance guidelines for unsignalized intersections set a minimum overall number of trips added to a critical movement at an unsignalized intersection and are supported by significance criteria for unsignalized intersections that are also identified in Table 1. Since the operations of unsignalized intersections under congested conditions are heavily influenced by traffic volume increases on critical moves, the significance guidelines for unsignalized intersections were based upon the number of trips added to a critical move. As stated above, this guideline directly relates to the number of vehicles that can be added to an existing queue that forms at the intersection. A significance guideline of twenty trips (peak hour) per critical movement was used for LOS E conditions. Although delays drivers experience under LOS E condition may be extreme, they are not yet considered unacceptable. The twenty trips spread out over the peak hour would not likely cause the intersection delay and/or existing queue lengths to become unacceptable. The twenty trips (peak hour) would not be noticeable to the average driver. A significance guideline of five trips (peak hour) per critical movement was used for LOS F conditions. The five trips spread out over the peak hour would not significantly increase the length of an existing queue and would not be noticeable to the average driver

A peak hour increase of twenty peak hour trips to the critical movement of an unsignalized intersection would be, on average, one additional car every 3.0 minutes. Assuming the average wait time for a vehicle in the critical movement queue is less than 3.0 minutes, this would not be noticeable to the average driver.

For smaller discretionary projects, without controversy, use of these guidelines is likely to be sufficient. For large projects, controversial projects, and/or projects which are preparing Environmental Impact Reports, more detailed evaluations to verify the applicability of the significance guidelines for the individual project conditions may be necessary. Additional evaluations may include analysis of vehicle headways, speeds, average gaps, queues, delay, and/or other factors.

4.4 Ramps

Additional or redistributed ADT generated by the proposed project will significantly increase congestion at a freeway ramp. Table 2 may be used as a guide in determining significant increases in congestion on ramps. Since the analysis of delays at ramps is still in its infancy these values should not be considered as absolutes. Factors affecting these values may include ramp metering, location (rural vs. urban), ramp design, and the proximity of adjacent intersections. Coordination with Caltrans and the local jurisdiction should be conducted to determine appropriate impact criteria for the specific ramps being assessed.

4.5 Hazards Due to a Design Feature

The following significance guidelines will be considered substantial evidence that a proposed project will have a significant traffic hazard impact due to a design feature. The determination of significance shall be on a case-by-case basis, considering the following factors:

- ***Design features/physical configurations of access roads adversely affect the safe transport of vehicles along the roadway.***

- ***The percentage and/or magnitude of increased traffic on the road due to the proposed project affect the safety of the roadway.***

- ***The physical conditions of the project site and surrounding area, such as curves, slopes, walls, landscaping or other barriers that could result in vehicle conflicts with other vehicles and/or stationary objects.***

- ***The project does not conform to the requirements of the private or public road standards, as applicable.***

4.6 Hazards to Pedestrians and/or Bicyclists

The following significance guidelines will be considered substantial evidence that a proposed project will have a significant traffic hazard impact to pedestrians and/or bicyclists. The determination of significance shall be on a case-by-case basis, considering the following factors:

- ***Design features/physical configurations adversely affect the visibility of pedestrians and/or bicyclists to drivers entering and exiting the site, and the visibility of cars to pedestrians and bicyclists.***

- ***The amount of pedestrian activity at the project access points may adversely affect pedestrian safety.***

- ***The project may result in the preclusion or substantial hindrance of the provision of a planned bike lane or pedestrian facility on a roadway adjacent to the project site.***

- ***The percentage and/or magnitude of increased traffic on the road due to the proposed project may adversely affect pedestrian and bicycle safety.***

- ***The physical conditions of the project site and surrounding area, such as curves, slopes, walls, landscaping or other barriers could result in vehicle/pedestrian, vehicle/bicycle conflicts.***

- ***The project does not conform to the requirements of the private or public road standards, as applicable.***

- ***The project may result in a substantial increase in pedestrian or bicycle activity without the presence of adequate facilities.***

5.0 GUIDELINES FOR PREPARING A TRAFFIC IMPACT STUDY (TIS)

A thorough traffic analysis will consider all aspects of a project (including all on- and off-site improvements). The analysis should identify whether these impacts are direct, indirect and/or cumulative in nature and determine whether the impacts are significant.

5.1 Overview of a Traffic Impact Study and General Contents

The purpose of a traffic impact study is to evaluate potential individual and cumulative traffic impacts that may result from a proposed project. Substantial increases in traffic volumes on and/or changes to the road network may cause congestion at existing and /or future roads and intersections. A detailed analysis of the traffic generated and/or redirected by a proposed project, assessment of potential impacts, and identification of mitigation measures for significant traffic impacts are the main focus of a traffic impact study.

The analysis of traffic issues, evaluation of traffic impacts, and development of mitigation measures for traffic impacts are complex tasks. The type and scope of a traffic impact study will vary based upon the size of a project, its location and other factors. Typically, a traffic impact study will include several components as outlined in Attachment B and summarized below:

~~?~~ 5.1.1 Existing Conditions

Documentation of the existing traffic volumes, levels of service, and geometrics for roads and intersections that may be potentially impacted by the proposed project must be provided. This assessment is typically based upon traffic counts that are less than two years old, unless it has been demonstrated that traffic volumes have not significantly changed since the prior counts were taken.

5.1.2 Trip Generation

Estimates of the number of trips that will be generated by the proposed project must be provided. Typically, SANDAG's Brief Guide of Vehicular Traffic Generation rates for the San Diego Region is used to prepare this estimate. Where a specific project is not defined in the brief guide then rates recommended by the Institute of Traffic Engineers and/or detailed case studies may be used to establish the trip rate assumption.

~~?~~ 5.1.3 Trip Distribution

The assignment of the estimated trips generated by the project or redistribution of existing traffic onto the existing and, if applicable, future road networks must be provided. For small projects this is typically done manually based upon traffic engineering judgment. For large projects, trips are distributed onto the road network based upon SANDAG's regional forecasting model, by using a select zone assignment. Per the CMP, large projects must distribute project trips based upon a computer model approved by SANDAG. This is typically, the SANDAG TRANPLAN model.

~~?~~ 5.1.4 Analysis of Potential Impacts

Detailed analysis of the potential traffic impacts for several analysis scenarios, as detailed later in this document, must be provided. Direct and cumulative impacts should be identified. This may necessitate the computation of the percentage of increase of trips at specified road segments and/or delay at intersections in addition to level of service calculations. More detailed analysis of specific potentially significant impacts may also be required

~~?~~ 5.1.5 Identification of Mitigation Measures

Specific improvements to mitigate direct impacts must be identified. Fairshare contributions toward improvements alone will not fully mitigate a direct impact, unless it can be shown and/or the project conditioned so the traffic generated by the project will not come to fruition before the improvements have been completed. Fairshare contributions toward cumulative impacts may only be provided when a specific project and schedule for completion of the project has been identified. The County in the future may consider adoption/establishment of a development impact fee program. If one is established for the area in which the proposed project lies, fairshare contributions may also be considered. A list of potential mitigation measures is provided in Section 6.0 of these guidelines.

~~?~~ 5.1.6 Other Applicable Concerns

Where applicable, traffic impact studies may also include an inventory and assessment of existing road geometrics for roads and intersections used by project traffic. Assessment of the design features (sharp curves, sight distance at intersections/driveways, and other features) and incompatible uses (farm equipment,

oversized loads, etc.) should be provided where the project may significantly increase hazards due to these items.

Where parking demand is high and/or the existing parking supply is low, traffic impact studies should include an assessment of the project's potential impact to parking availability/capacity. Refer to the "Guidelines for Determining Significance for Parking" for a detailed discussion of parking.

The traffic impact study should also identify adopted policies, plans, and programs supporting alternative transportation modes such as transit. Any conflicts that may result from implementation of the proposed project should be assessed and identified. Project design features such as bus turnouts, bicycle racks, pathways, etc. to help implement the adopted policies, and plans and/or programs should also be identified.

Emergency access should be coordinated with the local fire district, and the Department of Planning and Land Use (DPLU). Although an assessment of the need and adequacy of emergency access is not typically evaluated in a traffic impact study, if it is determined that a secondary access is required, the traffic distribution should include this access if it is open to through traffic. An evaluation of separate access alternatives may be required by DPLU to fully evaluate potential access routes to the proposed project.

5.2 Traffic Impact Study Need and Scope

For all discretionary development and public works projects, County staff will evaluate the need for a Traffic Impact Study (TIS). Guidelines for determining when and the type of traffic study are provided below. These are intended to serve as a guideline and are not intended to replace sound traffic engineering judgment.

5.2.1 Issue Specific Traffic Impact Study

All discretionary projects are required to evaluate individual and cumulative traffic impacts which may include preparation of a TIS. County staff may based upon a field review, public comment, and/or recommendations of a planning group require an issue specific TIS to address particular traffic issues. For example, an examination of available sight distance, driveway access, access road geometrics and capacity, parking capacity, intersection analysis or a signal timing study are issue specific/focused studies that could be required. Typically an issue specific TIS will be required for projects that generate between 200 and 500 average daily trips (ADT) or between 20 and 50 peak hour trips that may potentially impact or alter the design of a nearby intersection and/or road segment. However, cumulative impacts may require a TIS on even very small projects which add any trips to already impacted roads. The issue specific TIS shall address the specific issues identified by County staff.

5.2.2 Focused Traffic Impact Study

A focused TIS shall be prepared for all discretionary projects that generate between 500 and 1,000 total average daily trips (ADT) or between 50 and 100 peak-hour trips. The focused TIS shall assess potential traffic impacts to nearby local roads (streets) and intersections. Other criteria for determining whether a focused traffic analysis is required may include, but not be limited, by the following:

- The proposed project includes a driveway to be located on a Circulation Element Road within 150 feet of an intersection with another Circulation Element Road.

- The project includes a driveway that intersects an on-street bicycle lane or crosswalk in an area of high pedestrian activity.

- There are access risks or deficiencies associated with the adjoining street system due to curves, slopes, walls or other barriers to adequate lines of sight.

- The proposed project will result in a road alignment and/or design, which is inconsistent with the General Plan and/or community plan for the area or does not align with adjoining or proposed roads.

5.2.3 Full Traffic Impact Study

A full TIS shall be prepared for all discretionary projects that generate 1,000 or more total average daily trips (ADT) or 100 or more peak-hour trips. The full TIS shall assess potential impacts to regional arterials and state highways in addition to the potential impacts to nearby local roads (streets) and intersections.

A Congestion Management Program (CMP) analysis is required for all large projects, which are defined as generating 2,400 or more average daily trips or 200 or more peak-hour trips. Whenever build-out traffic projections are required, computerized long-range forecasts and select zone assignments may be provided. In addition, Caltrans may require a TIS when a proposed project will likely generate or redirect traffic that impacts a State highway or freeway (especially entrance and exit ramps). Please refer to the flow chart (Figure 1) for TIS requirements.

The geographic area examined in the full TIS and/or CMP analysis should include the following:

- Local roads and intersections as determined through coordination with the local planning group and County staff. Typically, this will include the access roads and the intersection of local roads with a Circulation Element road.

- All regional arterials (including all State surface routes), intersections, and mainline freeway locations where the proposed project will add 50 or more peak-hour trips in either direction to the existing roadway traffic.

- Freeway entrance and exit ramps as determined by coordination with Caltrans. These are defined as entrance and exit ramps that are currently experiencing a 15-min delay, which, combined with the proposed project, will add 20 or more peak hour trips to the ramp. (NOTE: Care must be taken to include other ramps and intersections that may receive project traffic diverted as a result of already existing, or projected congestion at freeway entrances and exits.)

Publicly initiated road improvement projects do not, in themselves, generate additional trips. They may, however, cause a redistribution of trips on the local and/or regional road network. Whenever the proposed road improvement project redistributes 500 or more average daily trips or 50 or more peak hour trips, a focused or full TIS shall be prepared as per the criteria outlined above. A separate or communal traffic needs assessment may also be performed to help establish the purpose and need of the road improvement project.

5.3 Scenarios to be Studied

An assessment of the proposed project's affects on existing conditions, cumulative conditions and at build-out conditions is required by CEQA. Existing conditions analysis assesses the affects the proposed project would have on the existing road infrastructure and network in the vicinity of the proposed project. The cumulative analysis will typically be based upon an assessment of past, present and probable future projects that will be developed in the vicinity of the proposed project. Where a specific plan or the County General Plan includes a summary of projects and the cumulative impacts have previously been assessed and environmental documents certified, the TIS may reference the prior study and show conformity with the specific plan and certified environmental document. Build-out conditions assess the project's impacts to the County's General Plan road network (Circulation Element). Projects which propose a change to the County's General Plan must prepare a build-out analysis. Projects that include near term development and propose a change to the County's General Plan and/or existing zoning must provide existing, cumulative and build-out conditions.

All of the scenarios that may be addressed in the TIS are described below:

5.3.1 Scenario Definitions

Existing
Document existing traffic volumes and peak-hour levels of service in the study area. The existing deficiencies and potential mitigation should be identified.

Existing + Project
Analyze the impacts of the proposed project on top of existing conditions.

Existing + Identified List of Projects
Analyze the cumulative condition impacts from "other" approved and "reasonably foreseeable" pending projects (application on file or in the pipeline) that are expected to influence the study area. This is the baseline against which project impacts are assessed. The responsible agency should provide copies of the traffic studies for the "other" projects. If data is not available for near-term cumulative projects, an ambient growth factor should be used. An ambient growth factor is an estimate of the annual traffic increase in the area. This factor may be based upon a trend analysis of the population and/or traffic growth for the previous five years.

Existing + Identified List of Projects + Proposed Project
Analyze the impacts of the proposed project on top of existing conditions and the identified list of projects (along with their committed or funded mitigation measures, if any).

Horizon Year
Identify Year 2020 traffic forecasts or 20-year future conditions through the output of a SANDAG model forecast (currently TRANPLAN) or other computer model approved by the local agency. If the proposed project is consistent with the land uses represented in the model, the TIS may only need to use this condition.

Horizon Year + Proposed Project
If the project land uses are more traffic intense than what was assumed in the horizon year model forecasts, analyze the additional project traffic impacts to the horizon year condition. When justified, and particularly in the case of very large developments or new general/community plans, a transportation model should be run with, and without, the additional development to show the net impacts on all parts of the area's transportation system.

For large projects, an opening day and/or other phasing scenarios may also be required.

5.4 Site Access

Project site access is analyzed in quantitative and/or qualitative terms, in conjunction with a review of internal site circulation and access to parking areas. In addition, peak hour LOS may be quantified for primary access points, using the procedures outlined herein. Conflicts that may be created by driveway configuration, placement of the driveway in areas of poor visibility, that are close or adjacent to bicycle and/or pedestrian facilities or in close proximity to busy or congested intersections should be identified. Conflicts with or restrictions of access to publicly or privately owned land should also be identified.

Assessment of adequate primary and secondary access to the project site will be made in coordination with the local fire protection district and where warranted other emergency response agencies, such as the Sheriff and California Highway Patrol. Documentation and assessment of existing road and intersection geometry may be

required to verify whether adequate access may be required. If deficiencies are identified recommendations to correct any deficiencies must be made.

The TIS analysis shall determine the effect that a project will have for each of the previously outlined study scenarios. Peak-hour capacity analyses for freeways, roadway segments (ADTs may be used in lieu of V/C ratios), intersections, and freeway ramps must be conducted for both the near-term and long-term conditions. The methodologies used in determining the traffic impact are not only critical to the validity of the analysis, they are pertinent to the credibility and confidence the decision-makers have in the resulting findings, conclusions, and recommendations. Key assumptions made in the TIS should be documented in the report.

5.5 TIS Analysis

The TIS analysis shall assess and identify whether impacts are direct or cumulative. Direct traffic impacts are those that would result from the proposed project alone (e.g. an impact that would occur if the proposed project was constructed by itself and no other projects were constructed). Cumulative traffic impacts are traffic impacts that would result from traffic generated and/or redirected by the proposed project in conjunction with other projects that will be constructed.

Evaluations of traffic safety impacts and hazards to pedestrians and/or bicyclists shall be based upon a field review and the collection of both qualitative and quantitative data. An evaluation of compliance with the County of San Diego Public Road Standards and the San Diego County Standards for Private Streets may be made. These standards allow the Director of Public Works to grant exceptions to these standards if needed. If an exception is granted, then the provisions and criteria outlined in the exception shall apply. When applicable, a summary of existing accident data on a road segment or at an intersection may also be provided.

Levels of Service for arterial road segments may be estimated on an ADT/24-hour traffic volume basis. Table 1 of the County of San Diego Public Road Standards may be used for roads located within the unincorporated area of San Diego County. Similar LOS Tables from the appropriate local jurisdiction should be used for local roads outside of the unincorporated area. Upon concurrence with County staff, Highway Capacity Manual (HCM) analysis methods may be used for specified arterials.

All level of service measurements for State highways shall be based upon HCM procedures for peak-hour conditions. The following methodologies for TIS analysis should be used (unless early consultation with the lead agency and Caltrans has established other methods), along with some suggested software packages and options:

- Arterials, Multi-lane and Two-lane Highways, and all other Local Streets - current Highway Capacity Manual [HCM]: w/Highway Capacity Software [HCS].

- Signalized Intersections – HCM: w/HCS, TRAFFIX, SigCinema, and SYNCHRO acceptable to Caltrans; and, HCS, TRAFFIX, SIGNAL 94, and NCAP acceptable to local jurisdictions.

- Unsignalized Intersections – HCM.

- Freeway Segments – HCM or Caltrans District 11 freeway LOS definitions (refer to Attachment A: w/HCS).

- Freeway Weaving Areas – Caltrans Highway Design Manual (Chapter 500).

- Freeway Ramps – Caltrans District 11 Ramp Metering Analysis (Attachment E), and Caltrans Ramp Meter Design Guidelines (August 1995), HCS (for ramp design only).

- Freeway Interchanges – HCM: for diamond interchanges where the timing and phasing of the two signals must be coordinated to ensure queue clearances, consider Passer III-90.

- Transit, Pedestrians, and Bicycles – HCM.

- Warrants for Traffic Signals, Stop Signs, School Crossings, Freeway Lighting, etc. – Caltrans' Traffic Manual.

- Channelization and Intersection Geometry - Caltrans' Traffic Manual and Guidelines for Reconstruction of Intersections, City of San Diego's Traffic Impact Study Manual -Appendix 4.

  Note: Neither the County nor Caltrans officially advocate the use of any special software packages, especially since new ones are being developed all the time. However, consistency with the Highway Capacity Manual (HCM) is advocated in most cases. The above-mentioned software packages have been utilized locally. Because it is so important to have consistent end results, always consult with all affected jurisdictions, including Caltrans, regarding the analytical techniques and software being considered (especially if they differ from above) for the TIS.

6.0 STANDARD MITIGATION AND PROJECT DESIGN CONSIDERATIONS

If a proposed project's traffic results in a significant traffic impact (as per the criteria specified above), mitigation for the traffic impact should be proposed. Potential mitigation measures can include traffic signal improvements, physical road improvements, street re-striping and parking prohibitions, fair share contributions toward identified and scheduled projects, and transportation demand management programs. A variety of possible generalized mitigation measures are provided below. Consult with County staff, as necessary, for further information. Conceptual striping plans to ensure feasibility of the proposed mitigation measures may be required.

6.1 Traffic Signal Improvements

- New Signal (provided that it meets traffic signal warrants)
- Signal modifications including signal timing, coordination, phasing improvements, etc.

6.2 Physical Road Improvements

- Turn Restrictions
- New Roadway
- Curve Realignment
- Roadway widening to add lanes and/or shoulders
- Provision of pathway or sidewalk
- Extension of truncated street
- Redesign of freeway on- and off-ramps
- Median construction/modification to restrict access
- Flaring of intersections to add turn lanes
- Provision of passing lanes and/or turnouts
- Acceleration and deceleration lanes
- Removal of obstructions (vegetation, rock outcroppings, utilities, etc.)

6.3 Street Re-striping and Parking Restrictions

- Re-striping to add lanes with or without parking removal or restrictions
- Protected left-turn pockets, or free right turn lanes
- Parking restrictions, daily or during peak hours

6.4 Fair share Contributions

- To road projects identified in the County's Capital Improvement Plan
- To traffic signals identified in the County's Traffic Signal Plan

6.5 Transportation Demand Management*

- Flexible or staggered work hours
- Traffic control measures
- Transit incentives and improvements including subsidized transit passes, bus turnouts, and/or bus shelters/benches
- Carpool, vanpool programs and participation in a computerized matching system

* Implementation of these measures will require monitoring on an on-going basis.

6.6 Traffic Safety/Hazard Impacts to Pedestrians and/or Bicyclists

If traffic safety or pedestrian/bicycle safety impacts are present, then conditions are placed on a project prior to approval to address those concerns. Often, compliance with County of San Diego Public or Private Road Standards will provide sufficient mitigation for an identified impact. However, site specific mitigation measures, such as the improvement of sight distance along the frontage of a project, will be imposed as a condition of approval. Conceptual striping plans to ensure feasibility of the proposed mitigation measures may be required.

Projects that would generate a high demand for pedestrian traffic such as schools, shopping centers, and large office parks should identify likely pedestrian and bicycle routes to the facilities and identify needed facilities to accommodate the pedestrian demand.

Bicycle lanes and routes designated on the County's General Plan must be specified and existing facilities identified. Provisions to provide/accommodate the ultimate right-of-way needed to construct designated bike lanes must be incorporated into the proposed project. Construction of bicycle lanes may be based upon the demand and connections to existing facilities in the area and input from the local community planning/sponsor group.

7.0 LIST OF REFERENCES

California Department of Transportation
Guidelines for the Preparation of Traffic Impact Studies, May 18, 2000.

California Public Resources Code
California Environmental Quality Act (PRC §21000-21178).

City of Los Angeles
Draft L.A. CEQA Thresholds Guideline, Section F, Transportation, Section F.1 through F.8. Unadopted document, May 14, 1998.

City of San Diego
Traffic Impact Study Manual, July 1998.

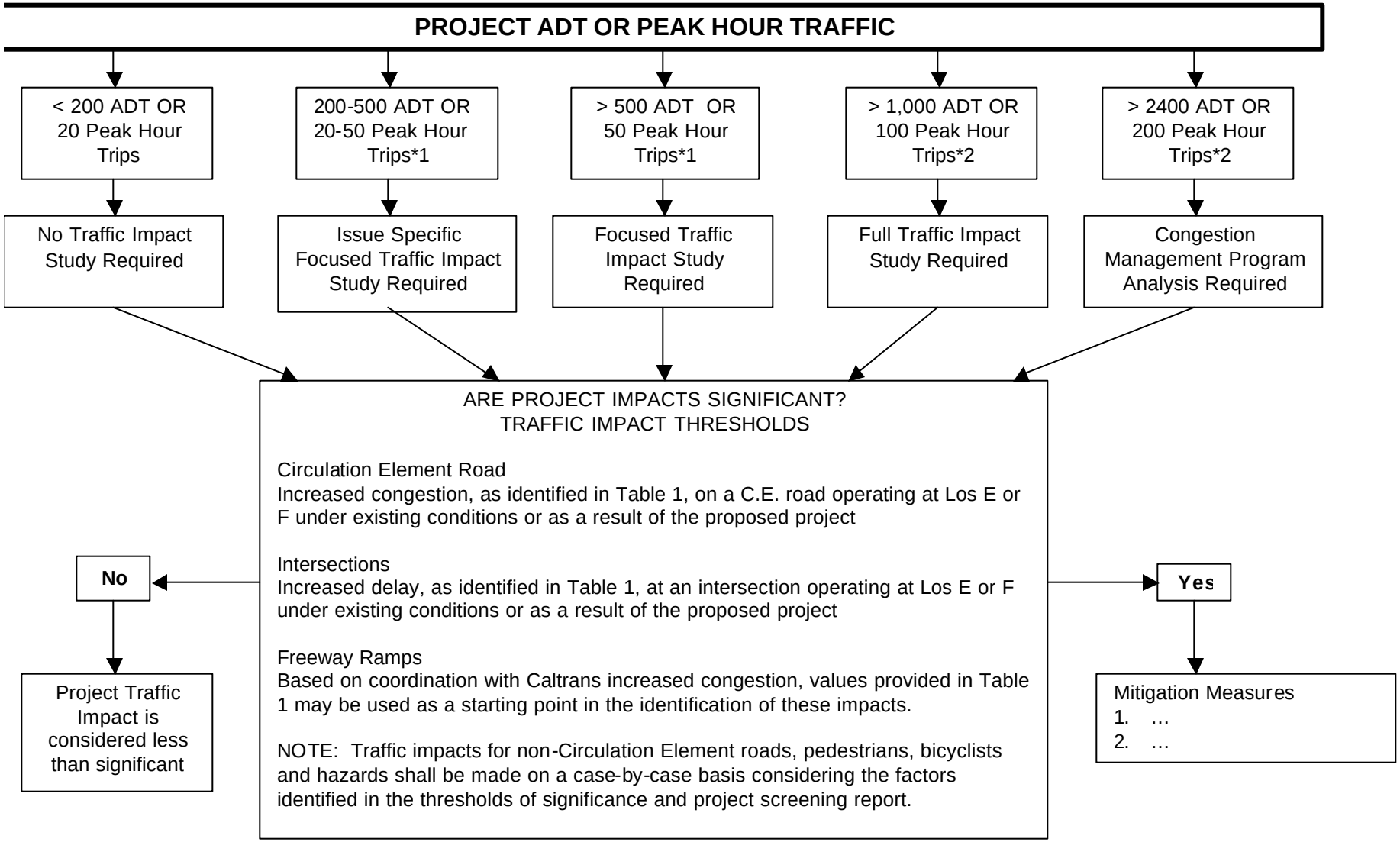
County of San Diego
CEQA Guidelines, 1997.
General Plan - Part XII, Public Facility Element, San Diego County General Plan. Adopted March 13, 1991, GPA 90-FE.
Guidelines for the Implementation of the California Environmental Quality Act. Unadopted document, August 1991. Pages 115-118. Department of Planning and Land Use.

Institute of Transportation Engineers (ITE). Traffic Access and Impact Studies for Site Development (A Recommended Practice), 1991.

San Diego Association of Governments
Draft Environmental Impact Report for the 2020 Regional Transportation Plan. . Prepared by Regional Environmental Consultants (Recon), November 19, 1999 .
2020 Regional Transportation Plan. Prepared by the San Diego Association of Governments, 1999a.

San Diego Traffic Engineers' Council (SANTEC) and the Institute of Transportation Engineers (ITE). SANTEC/ITE Guidelines for Traffic Impact Studies (TIS) in the San Diego Region (draft), March 2, 1999.

Figure 1
Significant Project Traffic Impact Assessment Flow Chart



1. Additional criteria for determining whether a Focused Traffic Study will be required: A) Whether or not residential streets will be used to access the project; B) Levels of Service at intersections & road segments in the vicinity of the project; C) Existing road conditions; D) Public Comment.
2. Typically ramp analysis is not required unless it is a CMP project. The need for a ramp analysis is based on the size & proximity of the road system.

NOTE: Analysis of cumulative traffic impacts may still require a focused study even when project direct traffic volumes do not.

Attachment A

Levels of Service Summary

Background

Level of Service

Level of service (LOS) is a quality of service measure that describes operational conditions on a transportation facility, such as a roadway or intersection. This service measure is a general overall measurement of several conditions such as speed and travel time, freedom to maneuver, traffic interruption, comfort and convenience.

Six LOS categories are defined for each type of facility. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions. Safety is not included in the measures that establish service levels.

Each transportation facility type has one or more of service measure that serves as the primary determinant of level of service for that facility type. This LOS-determining parameter is called the service measure or sometimes the measure of effectiveness (MOE). The MOE will vary from facility type to facility type. For instance, for intersections the MOE will be delay; for a road segment it may be the 24-hour volume, the volume to capacity ratio, speed or travel time along the facility.

Capacity

The capacity of a facility is the maximum number of persons or vehicles that can be expected to traverse a point or uniform section of road within a specified time frame under prevailing roadway, traffic and control conditions. Theoretically, this is the point in which the flow rate (vehicles/hour) on the facility is the highest. At lower traffic volumes, the peak hour operations will be low density with higher speeds. At higher traffic volumes, the peak hour operations will be of higher density, but at lower speeds. The flow rate can be measured in 15 minute, hourly or 24-hour intervals. Some general relationships/estimates have been established/assumed for converting from 24-hour average daily traffic measurements to peak hour measurements and vice-versa.

The highest volume attainable under LOS E defines the capacity of the arterial or collector. Operating conditions at capacity are unstable and difficult to predict. If this capacity is exceeded, operating conditions on the roadway change dramatically. Average travel speeds are extremely low, stop-and-go traffic occurs and excessive queuing may be present.

The capacity is related to level of service. The LOS E/LOS F threshold is identified as the capacity of the facility (roadway or intersection). Volumes to capacity ratios are calculated based upon this capacity (LOS E/LOS F) threshold.

Roadways

Roadways are classified based upon the roadway's function, control conditions and type roadside development, including its specific use, density and intensity. Road classifications for roadways located within the unincorporated area are described in the County of San Diego's General Plan Circulation Element and in the County of San Diego Public Road Standards. The road classifications provided therein may be grouped into four categories, arterials, collectors, residential roads and industrial/commercial roads. A description of each category and the method of determining LOS for each are discussed below:

Freeways

A freeway is defined as a divided highway with full control of access and two or more lanes for the exclusive use of traffic in each direction. Freeways provide uninterrupted flow. There are no signalized or stop-controlled intersections and direct access to and from adjacent property is not permitted. Access to the freeway is limited to ramp locations. Raised barriers, at-grade medians or continuous raised medians separate opposing directions of travel.

Operating conditions on a freeway primarily result from interactions among vehicles and drivers. Although speed is a major concern of drivers as related to service quality, freedom to maneuver within the traffic stream and proximity to other vehicles are equally noticeable concerns. These qualities are related to the density of the traffic stream. Unlike speed, density increases up to capacity.

The LOS criteria for freeways are defined to represent reasonable ranges in the three critical flow variables, speed, density and flow rate. They are as follows:

LOS A describes free flow operations. Free flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver in the traffic stream. The effects of incidents or point breakdowns are easily absorbed at this level.

LOS B represents reasonably free flow and free flow speeds are maintained. The ability to maneuver in the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and point breakdowns are still easily absorbed.

LOS C provides for flow with speeds at or near the free flow speed. Freedom to maneuver is noticeably restricted, and lane changes require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.

LOS D is the level at which speeds begin to decline slightly with increasing flows and density begins to increase somewhat more quickly. Freedom to maneuver is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.

LOS E describes operations at capacity, the highest density value. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream. Vehicles are closely spaced, leaving little room to maneuver. Speeds still exceed 49 mph. At capacity the traffic stream has no ability to dissipate even the most minor disruption, and any incident can be expected to produce a serious breakdown with excessive queuing. Maneuverability in the traffic stream is extremely limits and the level of physical and psychological comfort afforded the driver is poor.

LOS F describes breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. These may occur for a number of reasons, such as traffic incidents, merges, and lane drops. The breakdowns occur when the ratio of existing demand to actual capacity (or of forecasted demand to estimated capacity) exceed 1.00.

The level of service for freeway segments is estimated by calculating the demand to capacity or volume to capacity ratio. It is based upon the peak 15 min traffic flow as expressed in vehicles per hour. Adjustments to account for the types of vehicle in the traffic flow are provided in the HCM. Adjustments to the capacity to account for geometrics, grade and environmental factors, such as adverse weather conditions, are also provided.

Two-Lane Highways

A two-lane highway is a two-lane undivided roadway with one lane for each direction of travel. Traffic signals are spaced over two miles apart along the highway. Passing a slower vehicle requires the use of the opposing lane as sight distance and gaps are available. As volumes and geometric restrictions increase, the ability to pass decreases and platoons form. Motorists in platoons are subject to delay because they are unable to pass.

Many two-lane highways are located within the County of San Diego unincorporated area. These are primarily State highways such as SR 67, SR 76, SR 78 and SR 94. For State highways Caltrans design standards, which utilize a peak hour HCM analysis, is used. This methodology estimates traffic operations based upon terrain, geometric design and traffic conditions. Base conditions for terrain and geometric design have been identified which are applicable for most route segments. Procedures to account for segments, which differ from the base conditions, are also provided. The methodology is typically applied to highway segments at least 2 mile long.

In the HCM two-lane highways are categorized into two classes for analysis;

Class I – These are two-lane highways on which motorists expect to travel at relatively high speeds. These include major intercity routes connecting major traffic generators, daily commuters, and/or primarily links in the state or national highway network. They serve long distance trips or serve as connecting links between facilities that serve long trips.

Class II - These are two-lane highways on which motorists do not necessarily expect to travel at high speeds. They function as access routes to Class I facilities, serve as scenic/recreational routes and/or pass through rugged terrain. They often serve short trips, the beginning or ending portion of a longer trip or trips for which sightseeing/recreation plays a significant role.

The primary measures of level of service for Class I two-lane highways are percent time following and average travel speed. For Class II two-lane highways level of service is based only upon time spent following. Levels of service criteria of two-lane highways are defined based upon the peak period (15 min flow periods) and are intended for application to segments of significant length. They are defined as follows:

LOS A describes the highest quality of service, when motorists are able to travel at their desired speed. Without strict enforcement average speeds of 55 mph would be expected on Class I two-lane highways and platoons of three or more vehicles are rare. On Class II two-lane highways speeds may fall below 55 mph but motorists will not be delayed in platoons more than 40 % of their travel time.

LOS B characterizes traffic flow with speeds of 50 mph (slightly higher on level terrain), on Class I two-lane highways, and drivers are delayed in platoons up to 50 percent of the time. On Class II two-lane highways speeds may fall below 50 mph but motorists will not be delayed in platoons more than 55 % of their travel time.

LOS C describes further increases in traffic flow, resulting in noticeable increases in platoon formation, platoon size and frequency of passing impediments. The average speed still exceeds 45 mph on level terrain Class I two-lane highways. Although traffic flow is stable it is susceptible to congestion due to turning vehicles and slow-moving traffic. Percent time following may reach 65 %. On Class II two-lane highways speeds may fall below 45 mph but motorists will not be delayed in platoons more than 70 % of their travel time.

LOS D describes unstable flow. The two opposing traffic streams begin to operate separately and passing becomes extremely difficult. Turning vehicles and roadside distractions may cause disruptions to the traffic stream. The average speed of 40 mph can still be maintained on Class I two-lane highways, under base conditions, but mean platoon sizes of 5 to 10 vehicles are common. On Class II two-lane highways speeds may fall below 40 mph but motorists will not be delayed in platoons more than 85 % of their travel time.

LOS E traffic flow conditions have a percent time following greater than 80% for Class I two-lane highways and greater than 85% on Class II two-lane highways. Speeds may drop below 40 mph on Class I highways and may be as low as 25 mph on sustained grades. Passing is virtually impossible. Platooning becomes intense as slower vehicles or other interruptions are encountered.

LOS F represents heavily congested flow and speeds are highly variable.

The highest volume attainable under LOS E defines the capacity of the two-lane highway. Generally, this is 3,200 peak hour trips in both directions. Operating conditions at capacity are unstable and difficult to predict.

Arterials and Collectors

Arterials are roadways that primarily serve longer through trips. Providing access to abutting commercial and residential land uses is also an important function of arterials. Traffic signals are, typically, located at many intersections with public roads and major access points to adjacent land uses. Collectors are roadways provide both land access and traffic circulation. Their access function is more important than that of arterials and unlike arterials their operations is not always dominated by traffic signals.

On arterials, which are predominately uninterrupted on segments between major intersections, the Highway Capacity Manual 2000 evaluation method for Urban Streets may be used. Average travel speed on the road way is used as the determinant of operating LOS. The average travel speed is related to the traffic volume on the road. Exhibit 10-7 in the HCM 2000 provides a service volume Table that contains approximate hourly volumes and corresponding level of service estimates for different roadway types. Typically, the capacity of arterials, which have few interruptions between major intersections, is limited by the capacity of the intersections along the roadway.

The Highway Capacity Manual 2000 includes a method for evaluating level of service for urban streets. Urban streets are identified in the HCM 2000 as arterials with traffic signals spaced two miles or less apart. The HCM methodology primarily assesses the travel speed and level of service of the urban street based upon the operations and delay that occurs at the intersection along the urban street. A roadway's access function, however, is not assessed/included in this methodology. The level of access provided by a roadway should also be considered in evaluating its performance.

Most County arterials and collectors have frequent interruptions between major intersections. Capacity and level of service for arterials and collectors in the County of San Diego are usually determined based 24-hour average daily traffic according to Table 2 in the County of San Diego Standards for Public Roads. The 24-hour average daily traffic volumes are identified for each LOS category. They were based upon historical operations of County roads, comparisons with standards from other jurisdictions, and comparison with Highway Capacity Manual tables/guidelines. They account for both mobility and access along the roadway. They are derived based upon

average conditions and should be revised to account for special circumstances, such as reduced lane width, extreme grades and the provision of access improvements including turn lanes and acceleration/deceleration lanes. It should also be noted that, although not proportional to peak hour traffic volumes, the 24 hour ADT is often related to the peak hour volume. When the 24-hour volume is significantly increased, the peak hour volume is also typically significantly increased.

The following statements characterize LOS along arterials and collectors:

LOS A describes primarily free flow operations. Vehicles are completely unimpeded in their ability to maneuver into and within the traffic stream. Average travel speeds are approximately 90 % of the free flow speed. The free flow speed is the theoretical speed of traffic when no vehicles are present.

LOS B describes reasonably unimpeded traffic operations. The ability to maneuver into and within the traffic stream is only slightly restricted. Average travel speeds are approximately 70 % of the free flow speed.

LOS C describes stable operations. The ability to maneuver and change lanes in midblock locations may be more restricted than at LOS B. Average travel speeds are approximately 50 % of the free flow speed.

LOS D borders on a range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. The ability to maneuver into and within the traffic stream is limited with slight and infrequent delay. Average travel speeds are approximately 40 % of the free flow speed.

LOS E is characterized by significant delays. The ability to maneuver into and within the traffic stream is extremely limited. Average travel speeds are approximately 33 % or less than the free flow speed.

LOS F is characterized by high delays. Average travel speeds are extremely low with stop-and-go traffic and/or excessive queuing.

The highest volume attainable under LOS E defines the capacity of the arterial or collector. Operating conditions at capacity are unstable and difficult to predict. If this capacity is exceeded, operating conditions on the roadway change dramatically. Average travel speeds are extremely low, stop-and-go traffic occurs and excessive queuing may be present. Generally, the highest LOS E capacity for County arterials and collectors is identified in Table 1 of the County of San Diego Public Road Standards.

Residential Roads

Residential roads are provided to collect traffic from adjacent residential areas and lots. Their primary purpose is to provide a limited residential area access to and from the regional road network. Such roads are not envisioned to provide through traffic

generated in one community and destined for another. They are designed to accommodate local traffic.

Levels of service are not applied to residential roads. Due to the abutting and surrounding residential land uses, reduced traffic volumes are desired in order to minimize real and or perceived impacts to the adjacent uses. Residential roads are targeted to serve between 1,500 and 4,500 average daily trips (ADT). The County also has some special residential roads, which include frontage, alley and hillside residential. Due to the unique nature of these roads traffic may be less than 1500 ADT. Traffic volumes in excess of these targets may be accepted if other means of access to an area is precluded and/or found to be impractical due to such factors as environmental impacts, engineering, and no other legal access for an area.

Industrial/Commercial Roads

Industrial/Commercial roads provide access to abutting lots zoned for industrial and commercial uses. Their primary purpose is to provide a limited industrial/commercial area access to and from the regional road network. Such roads are not envisioned to provide through traffic generating in one community and destined for another. They are designed to accommodate a high percentage of trucks.

Levels of service are not applied to industrial/commercial roads. Due to the abutting and surrounding industrial/commercial land uses, reduced traffic volumes are desired in order to minimize real and or perceived impacts to the adjacent uses. Two-lane industrial/commercial roads are targeted to serve and 4,500 average daily trips. Four lane industrial/commercial roads are recommended for traffic volumes greater than 4,500 ADT. Traffic volumes in excess of 4,500 ADT may be accepted on two lane industrial/commercial road adequate abutting lot access improvements are provided and/or other means of access to an area is precluded and/or found to be impractical due to such factors as environmental impacts, engineering, and no legal access.

Intersections

Levels of service for intersection are estimated based upon the procedures provided in the HCM 2000. The HCM includes procedures for the analysis of signalized and unsignalized intersections. Capacity and traffic analysis focus on the peak hour of traffic volume, because it represents the most critical period for operations and has the highest capacity requirements. Since the flow rate can fluctuate substantially within the peak hour, assessments based upon the peak 15-minute flow rate are used. A discussion of these procedures is provided below.

Signalized Intersections

The analysis of signalized intersection is based upon a wide variety of prevailing traffic, roadway and signalization conditions. Traffic conditions include volumes on each approach, distribution of vehicles by movement (left, through, right), the vehicle type distribution, pedestrian cross flows and other factors. Roadway conditions include basic

geometrics of the intersection, such as the number and width of through lanes, the number and width of turn lanes, grades and adjacent parking lanes. Signalization conditions include signal phasing, timing, type of control and other factors.

The maximum capacity at signalized intersections is defined for each lane group. The lane group capacity is the maximum hourly rate of vehicles that can reasonably pass through the intersection. The flow rate is generally measured for a 15 min period and is stated in vehicles per hour (veh/hr). Capacity is evaluated in terms of the ratio of demand flow rate to maximum capacity (v/c ratio).

In the HCM methodology the capacity, LOS, and other performance measures are estimated for lane groups and intersection approaches. The overall LOS is also estimated for the intersection as a whole. The methodology, however, does not take into account the potential impact of downstream congestion of the intersection. Nor does the methodology detect and adjust for the impacts of left turn pocket overflows on through traffic and intersection operation.

Levels of service for signalized intersections are defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic and incidents. Although the control delay is estimated based upon a number of variables, for a given set of signal conditions the v/c ratio is a lead parameter of control delay. LOS for signalized intersections are estimated based upon a calculation of the v/c ratio, which is used with other factors to estimate the control delay.

Levels of service for signalized intersections are defined to represent reasonable ranges in control delay as follows:

LOS A describes operations with low control delay, up to 10 sec/vehicle. Many vehicles do not stop at all.

LOS B describes operations with control delay greater than 10 and up to 20 sec/vehicle. More vehicles stop than at LOS A, causing higher levels of control delay.

LOS C describes operations with control delay greater than 20 and up to 30 sec/vehicle. Individual cycle failures may begin at this level. Cycle failures occur when a given green phase does not serve all queued vehicles and overflows occur. The number of vehicles stopping is noticeable, though many still pass through the intersection without stopping.

LOS D describes operations with control delay greater than 35 and up to 55 sec/vehicle. At LOS D the influence of congestion becomes more noticeable. Many vehicles stop and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with control delay greater than 55 and up to 80 sec/vehicle. Individual cycle failures are frequent.

LOS F describes operations with control delay greater than 80 sec/vehicle. This level is considered unacceptable to most drivers. It often occurs when the arrival flow rates exceed the capacity of lane groups. Many individual cycles fail.

Unsignalized Intersections

Two-Way Stop-Controlled Intersections (TWSC)

Levels of service procedures are provided in the HCM for two-way stop-controlled (TWSC) intersections. Level of service for TWSC intersections is determined by estimating the control delay for each minor movement. The delay is estimated by determining the amount of available acceptable gaps for a driver to maneuver from and to the minor street. LOS is not defined for the intersection as a whole.

The LOS criteria for TWSC intersections are somewhat different from that of signalized intersections primarily because of different driver perceptions. The expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay than unsignalized intersections. LOS F occurs when there are not enough gaps of sufficient size to allow the minor street demand to safely cross through traffic on the major street. This is typically evident by extremely long control delays experienced by minor-street traffic. Drivers on the minor street may also start accepting smaller than usual gaps. In such cases safety may be a problem and some disruption of the major street traffic may occur.

All-Way Stop-Controlled Intersections (AWSC)

Levels of service procedures are provided in the HCM for all-way stop-controlled (AWSC) intersections. Level of service for AWSC intersections is determined by estimating the control delay per vehicle for each lane and each approach. The LOS for each approach and for the intersection as a whole is then estimated by computing weighted averages of the delay.

The LOS criteria for TWSC intersections are similar to that of signalized intersections. The criteria for LOS for AWSC intersections, however, have different threshold values than that for signalized intersections. The expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay than unsignalized intersections. A higher level of control delay is acceptable at a signalized intersection for the same LOS.

Roundabouts

The HCM manual includes procedures to estimate the capacity of single-lane roundabouts. It, however, does not include procedures for estimating the LOS of a roundabout. The capacity analysis is based upon gap acceptance techniques. The procedures are not applicable to multilane roundabouts. More details regarding the use

and experience of roundabouts in the Untied States are needed before an analysis procedure for multilane roundabouts will be provided in the HCM.

TABLE 1

AVERAGE DAILY VEHICLE TRIPS

CIRCULATION ELEMENT ROADS		LEVEL OF SERVICE				
CLASS	**X-SECTION**	**A**	**B**	C	D	E
Expressway	126/146	<36,000	<54,000	<70,000	<86,000	<108,000
Prime Arterial	102/122	<22,200	<37,000	<44,600	<50,000	<57,000
Major Road	78/98	<14,800	<24,700	<29,600	<33,400	<37,000
Collector	64/84	<13,700	<22,800	<27,400	<30,800	<34,200
Town Collector	54/74	<3,000	<6,000	<9,500	<13,500	<19,000
Light Collector	40/60	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Collector	40/84	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Light Collector	40/60	<1,900	<4,100	<7,100	<10,900	<16,200
Recreational Parkway	40/100	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Mountain	40/100	<1,900	<4,100	<7,100	<10,900	<16,200

NON – CIRCULATION ELEMENT ROADS		LEVEL OF SERVICE				
CLASS	**X-SECTION**	A	B	C	D	E
Residential Collector	40/60	*	*	<4,500	*	*
Residential Road	36/56	*	*	<1,500	*	*
Residential Cul-de-sac or Loop Road	32/52	*	*	< 200	*	*

*Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots, not carry through traffic. Levels of service normally apply to roads carrying through traffic between major trip generators and attractors.

LEVEL OF SERVICE (LOS) DEFINITIONS (generally used by Caltrans)

The concept of Level of Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A Level of Service[5] definition generally describes these conditions in terms of such factors as speed, travel time, freedom to maneuver, comfort and convenience, and safety. Levels of Service definitions can generally be categorized as follows:

LOS	D/C*	Congestion/Delay	Traffic Description
		(Used for freeways, expressways and conventional highways[A])	
"A"	<0.41	None	Free flow.
"B"	0.42-0.62	None	Free to stable flow, light to moderate volumes.
"C"	0.63-0.79	None to minimal	Stable flow, moderate volumes, freedom to maneuver noticeably restricted.
"D"	0.80-0.92	Minimal to substantial	Approaches unstable flow, heavy volumes, very limited freedom to maneuver.
"E"	0.93-1.00	Significant	Extremely unstable flow, maneuverability and psychological comfort extremely poor.
		(Used for conventional highways)	
"F"	>1.00	Considerable	Forced or breakdown. Delay measured in average flow, travel speed (MPH). Signalized segments experience delays >60.0 seconds/vehicle.
		(Used for freeways and expressways)	
"F0"	1.01-1.25	Considerable 0-1 hour delay	Forced flow, heavy congestion, long queues form behind breakdown points, stop and go.
"F1"	1.26-1.35	Severe 1-2 hour delay	Very heavy congestion, very long queues.
"F2"	1.36-1.45	Very severe 2-3 hour delay	Extremely heavy congestion, longer queues, more numerous breakdown points, longer stop periods.
"F3"	>1.46	Extremely severe 3+ hours of delay	Gridlock.

[5] Level of Service can generally be calculated using "Table 3.1. LOS Criteria for Basic Freeway Sections" from the latest Highway Capacity Manual. However, contact Caltrans for more specific information on determining existing "free-flow" freeway speeds.

* Demand/Capacity ratio used for forecasts (V/C ratio used for operational analysis, where V = volume)

[A] Arterial LOS is based upon average "free-flow" travel speeds, and should refer to definitions in Table 11.1 in the HCM.

Attachment B

Traffic Impact Study
Screencheck List

ATTACHMENT A

To be completed by Staff:
Date Received _____
Reviewer _____
Date Screen Check _____

TRAFFIC IMPACT STUDY
SCREEN CHECK

To be completed by consultant (including page #):
Name of Traffic Study _____
Consultant _____
Date Submitted _____

Indicate Page # in report:			Satisfactory YES	Satisfactory NO	NOT REQUIRED
pg. _____	1.	Table of contents, list of figures and list of tables.	☐	☐	
pg. _____	2.	Executive summary.	☐	☐	
pg. _____	3.	Map of the proposed project location.	☐	☐	
	4.	General project description and background information:			
pg. _____		a. Proposed project description (acres, dwelling units....)	☐	☐	
pg. _____		b. Total trip generation of proposed project.	☐	☐	
pg. _____		c. Community plan assumption for the proposed site.	☐	☐	
pg. _____		d. Discuss how project affects the Congestion Management Program, if applicable	☐	☐	
pg. _____	5.	Parking, transit and on-site circulation discussions are included.	☐	☐	
pg. _____	6.	Map of the Transportation Impact Study Area and specific intersections studied in the traffic report.	☐	☐	
pg. _____	7.	Existing Transportation Conditions:			
		a. Figure identifying roadway conditions including raised medians, median openings, separate left and right turn lanes, roadway and intersection dimensions, bike lanes, parking, number of travel lanes, posted speed, intersection controls, turn restrictions and intersection lane configurations.	☐	☐	
		b. Figure indicating the daily (ADT) and peak-hour volumes.	☐	☐	
		c. Figure or table showing level of service (LOS) for intersections during peak hours and roadway sections within the study area (include analysis sheets in an appendix).	☐	☐	
	8.	Project Trip Generation:			
pg. _____		Table showing the calculated project generated daily (ADT) and peak hour volumes.	☐	☐	
pg. _____	9.	Project Trip Distribution using the current TRANPLAN Computer Traffic Model (provide a computer plot) or manual assignment if previously approved. (Identify which method was used.)	☐	☐	
	10.	Project Traffic Assignment:			
pg. _____		a. Figure indicating the daily (ADT) and peak-hour volumes.	☐	☐	
pg. _____		b. Figure showing pass-by-trip adjustments, and, if cumulative trip rates are used.	☐	☐	☐
	11.	Existing Near-term Cumulative Conditions:			
pg. _____		a. Figure indicating the daily (ADT) and peak-hour volumes.	☐	☐	
pg. _____		b. Figure or table showing the projected LOS for intersections during peak hours and roadway sections within the study area (analysis sheets included in the appendix).	☐	☐	
pg. _____		c. Traffic signal warrant analysis (Caltrans Traffic Manual) for appropriate locations.	☐	☐	
	12.	Existing Near-term Cumulative Conditions + Proposed Project (each phase			

Indicate Page # in report: (when applicable)		Satisfactory YES	Satisfactory NO	NOT REQUIRED
pg. _____	a. Figure or table showing the projected LOS for intersections during peak hours and roadway sections with the project (analysis sheets included in the appendix).	☐	☐	
pg. _____	b. Figure showing other projects that were included in the study, and the assignment of their site traffic.	☐	☐	
pg. _____	c. Traffic signal warrant analysis for appropriate locations.	☐	☐	
	13. Horizon Year Transportation Conditions (if project conforms to the General/ Community Plan):			
pg. _____	a. Horizon Year ADT and street classification that reflect the Community Plan.	☐	☐	☐
pg. _____	b. Figure or table showing the horizon LOS for intersections during peak hours and roadway sections <u>with</u> and <u>without</u> the project (analysis sheets included in the appendix).	☐	☐	☐
pg. _____	c. Traffic signal warrant analysis at appropriate locations.	☐	☐	☐
	14. Horizon Year Transportation Conditions + Proposed Project (if project does not conform to the General/Community Plan):			
pg. _____	a. Horizon Year ADT and street classification as shown in the Community Plan.	☐	☐	☐
pg. _____	b. Horizon Year ADT and street classification for two scenarios: with the proposed project and with the land use assumed in the Community Plan.	☐	☐	☐
pg. _____	c. Figure or table showing the horizon LOS for intersections during peak hours and roadway sections for two scenarios: <u>with</u> and <u>without</u> the proposed project and with the land use assumed in the Community Plan (analysis sheets included in the appendix).	☐	☐	☐
pg. _____	d. Traffic signal warrant analysis at appropriate locations with the land use assumed in the General/Community Plan.	☐	☐	☐
pg. _____	15. A summary table showing the comparison of Existing, Existing + Near-term Cumulative, Existing + Near-term Cumulative + Proposed Project, Horizon Year, and Horizon Year + Proposed Project (if different from General/Community Plan), LOS on roadway sections and intersections during peak hours.	☐	☐	
pg. _____	16. A summary table showing the project's "significant traffic impacts."	☐	☐	
	17. Transportation Mitigation Measures:			
pg. _____	a. Table identifying the mitigations required that are the responsibility of the developer and others. A phasing plan is required if mitigations are proposed in phases.	☐	☐	
pg. _____	b. Figure showing all proposed mitigations that include: intersection lane configurations, lane widths, raised medians, median openings, roadway and intersection dimensions, right-of-way, offset, etc.	☐	☐	
pg. _____	18. The Highway Capacity Manual Operation Method or other approved method is used at appropriate locations within the study area.	☐	☐	
pg. _____	19. Analysis complies with Congestion Management Program requirements.	☐	☐	☐
pg. _____	20. Appropriate freeway analysis is included.	☐	☐	☐
pg. _____	21. Appropriate freeway ramp metering analysis is included.	☐	☐	☐
pg. _____	22. The traffic study is signed by a California Registered Traffic Engineer.	☐	☐	

THE TRAFFIC STUDY SCREEN CHECK FOR THE SUBJECT PROJECT IS:

_____ Approved

_____ Not approved because the following items are missing:

_____

_____

_____

Attachment C

County Staff Criteria for the Need To Prepare a Traffic Impact Study (TIS)

Project Generated Traffic*	**Focused TIS Needed**	**Full TIS Needed**	**Congestion Management Analysis Needed**
Less than 200 Average Daily Trips OR Less than 20 Peak Hour Trips	No	No	No
500 Average Daily Trips OR 50 Peak Hour Trips	Yes	No	No
1,000 Average Daily Trips OR 100 Peak Hour Trips	No	Yes	No
2,400 Average Daily Trips OR 200 Peak Hour Trips	No	Yes	Yes

* Other situations could result in a request for an Issue Specific and/or Focused Traffic Impact Study. These include, but are not limited to, those issues addressed in this report.

NOTE: Analysis of cumulative traffic impacts may require a Traffic Impact Study, even when project generated traffic volumes alone do not.

Attachment D

Definitions of Key Terms

Level of Service (LOS) corresponds to “excellent” through “failure” conditions in terms of traffic congestion, both for road segments and for intersections. It is used to provide an indication of the amount of delay a driver would experience along a road segment or the amount of wait time a driver would experience at an intersection. *LOS* is rated on a scale of A through F, with A representing excellent, free flow conditions, and F representing failures of road segments or intersections.

Volume to Capacity (V/C) Ratio is ratio of the actual traffic volume of a road segment or intersection to the design capacity of the road segment or intersection. It is used to provide an estimate of the level of service of the road segment or intersection.

AM or PM Peak Hours are those hours of the day in which the bulk of commute trips occur and in which traffic impacts are likely to be the greatest.

Average Daily Traffic (ADT) is the number of vehicles that use a roadway segment within a 24-hour period.

Capacity of a transportation facility is the maximum number of persons or vehicles that can be expected to traverse a point or uniform section of road within a specified time frame under prevailing roadway, traffic and control conditions. Theoretically, this is the point in which the flow rate (vehicles/hour) on the facility is the highest. The highest volume attainable under LOS E has been designated as the capacity of the arterial or collector.

Attachment E

Ramp Metering Analysis

RAMP METERING ANALYSIS

Ramp metering analysis should be performed for each horizon year scenario in which ramp metering is expected. The following table shows relevant information that should be included in the ramp meter analysis "Summary of Freeway Ramp Metering Impacts."

LOCATION	DEMAND (veh/hr)[1]	METER RATE (veh/hr)[2]	EXCESS DEMAND (veh/hr)[3]	DELAY (min)[4]	QUEUE (feet)[5]

NOTES:

[1] DEMAND is the peak hour demand expected to use the on-ramp.

[2] METER RATE is the peak hour capacity expected to be processed through the ramp meter. This value should be obtained from Caltrans. Contact Carolyn Rumsey at (619) 467-3029.

[3] EXCESS DEMAND = (DEMAND) – (METER RATE) or zero, whichever is greater.

[4] $\text{DELAY} = \dfrac{\text{EXCESS DEMAND}}{\text{METER RATE}} \times 60 \text{ MINUTES/HOUR}$

[5] QUEUE = (EXCESS DEMAND) X 29 feet/vehicle

NOTE: Delay will be less at the beginning of metering. However, since peaks will almost always be more than one hour, delay will be greater after the first hour of metering. (See discussion on next page.)

SUMMARY OF FREEWAY RAMP METERING IMPACTS
(Lengthen as necessary to include all impacted meter locations)

LOCATION(S)	PEAK HOUR	PEAK HOUR DEMAND D	FLOW (METER RATE) F	EXCESS DEMAND E	DELAY (MINUTES)	QUEUE Q (feet)
	AM PM					
	AM PM					
	AM PM					

DISCUSSION OF RAMP METER ANALYSIS

A. CAUTION: The ramp metering analysis shown in Attachment B may lead to grossly understated results for delay and queue length, since important aspects of queue growth are ignored. Also, the draft guidelines method derives average values instead of maximum values for delay and queue length. Utilizing average values instead of maximum values can lead to obscuring important effects, particularly in regard to queue length.

Predicting ramp meter delays and queues requires a storage-discharge type of analysis, where a pattern of arriving traffic at the meter is estimated by the analyst, and the discharge, or meter rate, is a somewhat fixed value set by Caltrans for each individual metered ramp.

Since a ramp meter queue continues to grow longer during all times that the arrival rate exceeds the discharge rate, the maximum queue length (and hence, the maximum delay) usually occurs after the end of the peak (or highest) one hour. This leads to the need for an analysis for the entire time period during which the arrival rate exceeds the meter rate, not just the peak hour. For a similar reason, the analysis needs to consider that a substantial queue may have already formed by the beginning of the "peak hour." Traffic arriving during the peak hour is then stacked onto an existing queue, not just starting from zero as the draft analysis suggests.

Experience shows that the theoretical queue length derived by this analysis often does not materialize. Motorists, after a brief time of adjustment, seek alternate travel paths or alternate times of arrival at the meter. The effect is to approximately minimize total trip time by seeking out the best combinations of route and departure time at the beginning of the trip. This causes at least two important changes in the pattern or arriving traffic at ramp meters. First, the peak period is spread out, with some traffic arriving earlier and some traffic arriving later than predicted. Second, a significant proportion of the predicted arriving traffic will use another ramp, use another freeway, or stay on surface streets.

It is acceptable to make reasonable estimates of these temporal and spatial (time and occupying space) diversions as long as all assumptions are stated and that the unmodified, or theoretical values are shown for comparison.

B. Additional areas for study include being able to define acceptable levels of service (LOS) and "significant" thresholds (e.g., a maximum ramp meter delay of 15 minutes) for metered freeway entrance ramps.

Currently there are no acceptable software programs for measuring project impacts on metered freeway ramps nor does the Highway Capacity Manual (HCM) adequately address this issue. Hopefully in the near future a regionwide study will be initiated to determine what metering rate (at each metered ramp) would be required in order to guarantee that traffic will flow (even at LOS "E") on the entire freeway system during peak-hour conditions. From this, the ramp delays and resultant queue lengths might then be calculated. Overall, this is a very complex issue that needs considerable research and refinement in cooperation with Caltrans.